

ON THE IDENTITY OF
ASTACUS (CAMBARUS) MEXICANUS ERICHSON (1846)
AND *CAMBARUS AZTECUS* SAUSSURE (1857)
(DECAPODA: CAMBARIDAE) WITH THE DESCRIPTION
OF *PROCAMBARUS OLMECORUM*, NEW SPECIES,
FROM VERACRUZ, MEXICO

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Abstract.—The Mexican crayfish *Procambarus (Austrocambarus) mexicanus* (Erichson, 1846), from the state of Veracruz, is redescribed and declared a subjective senior synonym of *Cambarus aztecus* Saussure, 1857. The name *Procambarus (Austrocambarus) olmecorum* is proposed as a substitute name for the sympatric *Procambarus aztecus* Villalobos (1954) which is also redescribed and illustrated. As complete a list of references as the author has been able to assemble is offered for both species.

Uncertainty seems to have existed concerning the identity of both *Astacus (Cambarus) Wiegmanni* and *Astacus (Cambarus) Mexicanus* since they were described by Erichson in 1846, and the quandary was compounded with the description of *Cambarus aztecus* by Saussure in 1857. Of those who attempted to clarify the identity of these crayfishes and other of their close relatives, the most recent was Villalobos (1954, repeated in 1955 and 1983) who presented a historical summary of all recorded pertinent facts and opinions, added additional information, and offered proposals that he believed would clarify the confusion that was clearly evident in, and had persisted since the publication of, Hagen's (1870) monograph of the North American crayfishes. Only facts that seem immediately pertinent to establishing the identity of *Astacus (Cambarus) mexicanus* and de Saussure's (1857) *Cambarus aztecus* are repeated here, although as complete synonymies for the species treated as I have been able to ferret are included.

The two crayfishes described by Erichson were the first reported from Mexico, but, unfortunately, in his rather brief accounts

of them, he did not record the locality from which his specimens had been collected. Apparently these crayfishes were not available to subsequent students of crayfishes. Whether or not Saussure sought Erichson's material is not known, but in describing the third and fourth species (*Cambarus Montezumae* and *Cambarus aztecus*) from Mexico, he did not mention having seen Erichson's "types." Almost certainly his knowledge of these species was derived solely from Erichson's descriptions, and only two specific differences were noted between his *C. aztecus* and *C. mexicanus*: "... les mains sont comprimées, non cylindriques comme chez l'espèce citée, puisque les bras sont épineux, etc." (Saussure 1858:461). Hagen was unsuccessful in his search for Erichson's types in the Berlin Museum in September 1870 (Faxon 1885:38) as was von Martens (1872:131), but Hagen (1870) expressed the opinion that Saussure's *C. aztecus* was identical to Erichson's *C. Wiegmanni* and that *C. Montezumae* was the young of *C. mexicanus*. These opinions are clearly without merit, for males of *C. Montezumae*, as described, possess hooks on the second and third pairs of pereopods, *C.*

mexicanus, on the third, and *C. wiegmanni*, on the third and fourth. Hagen suggested that the different positions of the hooks were based upon Erichson's counting the chelipeds as the first pair of legs and Saussure's numbering the leg immediately posterior to the chelipeds as the first. This suggestion cannot be taken seriously since indeed the male of Saussure's *C. Montezumae* does exhibit hooks on the second and third pairs of pereopods. Faxon (1885), while unable to distinguish between *Cambarus mexicanus* and *C. aztecus*, recognized the distinctness of *C. wiegmanni* and *C. montezumae* on the basis of the characters just cited.

Because of the lack of material from Mexico, not until 1954 was an apparently rewarding effort made to clarify the status of *Cambarus mexicanus*, *C. aztecus*, and *C. wiegmanni*. In resolving the synonymy of *C. aztecus* with *C. mexicanus* proposed by Faxon (1885, 1914) it was necessary to associate the latter name with specimens from a known locality, and with good reason Villalobos (1954: 305) selected a specimen in the Academy of Natural Sciences of Philadelphia from El Mirador de Zacuapan, 8 km northeast of Huatusco, Veracruz, as the neotype of Erichson's *A. (Cambarus) mexicanus*. Apparently unaware that syntypes of *C. aztecus* were still extant, he described and illustrated specimens that he had collected in the presumed type locality, Tomatlán, 14 km south-southeast of Huatusco, Veracruz, as members of Saussure's species.

Had the syntypes of Saussure's *C. aztecus* not been extant, the problem of the identity of the two species would have been solved. That the specimens described by Villalobos as *Procambarus aztecus* were not conspecific with a syntype of Saussure's species in the collections of the Smithsonian Institution came to light when, in preparing illustrations for a checklist of the North and Middle American crayfishes (Hobbs 1974), I discovered that my drawing of the carapace of the Smithsonian syntype did not

agree with Villalobos' illustration (Villalobos 1954:pl. III, fig. 1). I pointed this out to Dr. Villalobos, and, prior to his untimely death in October 1983, we had agreed to collaborate in attempting to rectify previously erroneous concepts of the two species. The most conspicuous difference between the specimens illustrated by Villalobos and the syntype is in the width of the areola. The illustration of *C. aztecus* provided by Saussure strangely lacks lines representing the branchiocardiac grooves so that in it the expanse of the areola cannot be determined. This could well be interpreted as the animal's possessing an obliterated one! But in the syntypes in the Muséum d'Histoire Naturelle, Geneva, and in that in the Smithsonian Institution currently available to me the areola is distinctly "open" throughout its length, about 10 times as long as broad—not obliterated along part of its length as occurs in Villalobos' *P. aztecus*.

On the basis of Villalobos' (1954:312) designation of a neotype of *Astacus (C.) mexicanus*, the identity of this species became established, and the locality from which the neotype was collected is known! Unfortunately, this specimen is in poor condition, and instead of preparing an adequate description based upon it, I have chosen neotopotypic specimens which have been compared with the neotype, to illustrate the species. In view of the existence of syntypes, the identity of *Cambarus aztecus* Saussure seems clear, and now their source is reasonably assured. Since presumed topotypes proved to be members of another species, and there are at least five "communities" in Mexico bearing the name Tomatlán, the question had to be asked as to whether or not the locality given by Saussure, "Pris à Tomatlan, dans les Terres-Chaudes" is the same as that from which the specimens described by Villalobos, "Tomatlán, 14 km S.S.W. of Huatusco, Veracruz," came? Not until specimens that were conspecific with the syntypes became available from or nearby one of the To-

matláns could reasonable certainty of the location of that referred to by Saussure be assumed.

Of the five Mexican "communities" bearing the name Tomatlán listed in the gazetteer available to me, only that 14 km S.S.W. of Huatusco, Veracruz (19°02'N, 97°00'W), lies within the known range of the subgenus *Austrocambarus* to which *Procambarus* (*A.*) *aztecus* belongs. Moreover, specimens that differ only in minor respects from the syntypic male at hand were obtained from localities both north and south of the town. Thus, there is every reason to believe that it lies within the range of the species and is likely the same Tomatlán from which Saussure's specimens came.

The neotype and neotopotypes of *P. (A.) mexicanus* have been compared with the syntype of *C. aztecus* and with other specimens assignable to it from a number of localities in the vicinity of the two type localities (which are no more than 40 km apart), and I am convinced that the few differences noted between specimens assigned to the two, represent nothing more than individual variations. Among those features noted, none even seems to be restricted to a limited part of the range of the species. In view of these observations, I am proposing that *Cambarus aztecus* Saussure, 1857, be placed in the synonymy of *Cambarus mexicanus* (Erichson, 1846). Neither the characters pointed out by Saussure nor differences noted between the neotypes of the latter and syntypes of *C. aztecus* will serve consistently to separate populations of one from the other. I have examined, but do not have before me, the specimens that Villalobos described and figured as members of *Cambarus aztecus*. Available, however, are series from nearby localities that appear to be unquestionably conspecific with his material from Tomatlán and from near Coscomatepec, both localities in Veracruz. These specimens exhibiting an areola that is obliterated along a part of its length must be accorded a new name, and a description

and illustrations of this crayfish are offered herein. Because of the confusion surrounding the identities of *Procambarus* (*A.*) *mexicanus* and *P. (A.) aztecus*, a description and illustrations of the syntypic male, form I, of the latter are included.

Procambarus (*Austrocambarus*)
mexicanus (Erichson)

Fig. 1

Astacus (*Cambarus*) *Mexicanus* Erichson, 1846:99–100 [Type locality: Mexico, restricted by Villalobos (1954:305) to El Mirador de Zacuapan, 8 km NE of Huatusco, Veracruz; neotype: male, form I, Academy of Natural Sciences of Philadelphia, no. 4176].—Villalobos, 1953:352, 353; 1954:299, 300, 301, 302; 1955:15; 1983:19.

Astacus Mexicanus.—Erichson, 1846:87, 88.—Hagen, 1870:7.—Martens, 1872:131.

Astacus mexicanus.—Dana, 1852:522.—Hobbs, 1972a:1.

Cambarus aztecus Saussure, 1857:503–504, fig. 23 [Type locality: "Pris à Tomatlan, dans les Terres-Chaudes," Veracruz, Mexico. Syntypes: Muséum d'Histoire Naturelle, Geneva, uncatalogued, 13 dry specimens; USNM, 20682, 1 male, form I.]; 1858:460–461, pl. III: fig. 23.—Hagen, 1870:11, 12, 55.—Martens, 1872:131.—Schmeltz, 1874:79.—Faxon, 1884:141, 142; 1885:5, 9, 10, 38, 51 m, 123, 172, 174; 1914:410.—Torralbas, 1917:596 (53), figs. 61, 62.—Villalobos, 1953:353–363; 1954:300, 302, 314; 1955:15; 1982:19.—Hobbs, 1972a:2.

Cambarus Mexicanus.—Saussure, 1858:460 (44).—Hagen, 1870:11, 12, 75, 84–85, 98, 102 (part).—Faxon, 1884:138, 139, 141–142 (part); 1885:5, 8, 9, 38–39, 47–48, 50–51, 53, 76, 158, 172–174, 177 (part).—Villalobos, 1950:381; 1955:140; 1983:136.—Hobbs, 1972a:2.

Cambarus mexicanus.—Saussure, 1858:461 (45).—Ortmann, 1892:12 (part); 1902:

- 277, 283, 284, 341; 1905a:99, 103; 1905b:435, 436.—Faxon, 1898:649; 1914:363, 410 (part).—Hay, 1899:964.—Harris, 1903:58, 108, 151, 155 (part).—Ellis, 1919:254, 264.—Goodnight, 1940:63.—van Straelen, 1942:5.—Villalobos, 1946:216; 1950:381, 382; 1955:140; 1983:136.—Hart, 1961:78, 79.—Hobbs and Villalobos, 1964:321, 324.—Holt, 1968:15.
- Cambarus Aztecus*.—Hagen, 1870:11.
- Astacus Aztecus*.—Martens, 1872:131.
- Cambarus (Cambarus) mexicanus*.—Ortmann, 1905a:101, 103.—Villalobos, 1946:216.
- Cambarus (Procambarus) mexicanus*.—Ortmann, 1905b:437–438, 441 [by implication, in part]; 1906:11, 15, 21, 23; 1913:416, 417.—Hobbs, 1942a:57, 60, 61, pl. 2:fig. 12.—Rioja, 1940:249.—Villalobos, 1953:354; 1954:302; 1955:17; 1983:20.—Hobbs and Villalobos, 1964:322.
- Astacus Astecus*.—Valdés Ragués, 1909:180 [erroneous spelling].
- Procambarus aztecus*.—Hobbs, 1942b:342 [by implication].—Villalobos, 1953:346, 363; 1954:300, 302, 304, 314 (in part); 1955:239; 1982:227.—Hart and Hart, 1974:124, 142.—Spitzzy, 1976:445.
- Procambarus mexicanus*.—Hobbs, 1942b:342 [by implication], 355, pl. III, figs. 11, 13; 1942c:38; 1943:203, 205, 206; 1966:70, 71; 1967:8; 1969:118; 1971:3, 12, 30, 31, 41; 1972b:151, figs. 5h, 30f, 35b, 36a.—Villalobos, 1946:218; 1948:182; 1950:382, 385, pl. 4: figs. 2, 4; 1953:346, 365; 1954:299, 302–307, 310, 312–314, 317, 318, 321, 323, 328, 335, 346, 364, 375, pls. 1, 2; 1955:15, 22, 139, 140, 141, 159–169, 172, 173, 176, 178, 183, 201, 239, 240, pls. 28 (figs. 2, 4), 34, 35; 1983:17, 25, 134, 136, 154–163, 166–168, 170, 171, 176, 192, 227, 228, pls. 28 (figs. 2, 4), 34, 35.—Rioja, 1949:316, 321 (part), 322, 327.—Hobbs and Villalobos, 1964:313, 314, 346.—Hobbs III, 1969:21.—Straskraba, 1969:25.—Holt, 1973:4, 5, 17, 20, 25, 26, 32.—Hart and Hart, 1974:22, 23, 86.—Spitzzy, 1976:443, 444.—Fitzpatrick, 1983:165, fig. 171.
- Procambarus mexiacnus*.—Villalobos, 1954:304 [erroneous spelling].
- Procambarus Mexicanus*.—Creaser, 1962:7, fig. 8.
- Procambarus (Astrocambarus) mexicanus*.—Hobbs, 1972a:6; 1972b (1976):43; 1974:45, fig. 173.—Feldmann et al., 1981:794, text-fig. 3.—Fitzpatrick, 1983:202.—Villalobos, 1982:219.
- Procambarus (Astrocambarus) aztecus*.—Hobbs, 1972a:6; 1972b (1976):43, 150, figs. 30e, 34c, 36b; 1974:44, 123, fig. 172.—Fitzpatrick, 1983:202.
- Diagnosis*.—Body pigmented, eyes well developed. Rostrum of adults without marginal spine and median carina. Carapace with or without small cervical spine or tubercle. Areola 6.5 to 17 times as long as wide and constituting 30.2 to 37.4 (average 32.8) percent of total length of carapace (37.1 to 46.0, average 40.3, percent of postorbital carapace length). Suborbital angle weak and obtuse; infraorbital spines lacking. Postorbital ridge moderately strong and anterior extremity with or without spine or tubercle. If present, branchiostegal spine small. Antennal scale about twice as long as broad, widest slightly distal to midlength. Cheliped studded with subsquamous tubercles from midlength of merus to about midlength of fingers. Ischium of third pereopod of first form male with simple, strong, acute hook usually overreaching basioischial articulation; hook not opposed by tubercle on corresponding basis. First pleopods of first form male reaching coxae of third pereopods, symmetrical, usually contiguous basally, lacking proximomesial spur; simple angular or produced shoulder present on cephalic surface at about base of distal eighth; lacking subterminal setae; terminal elements consisting of short, acute distolaterally directed mesial process extending beyond short, corneous subacute, cephalodistally directed

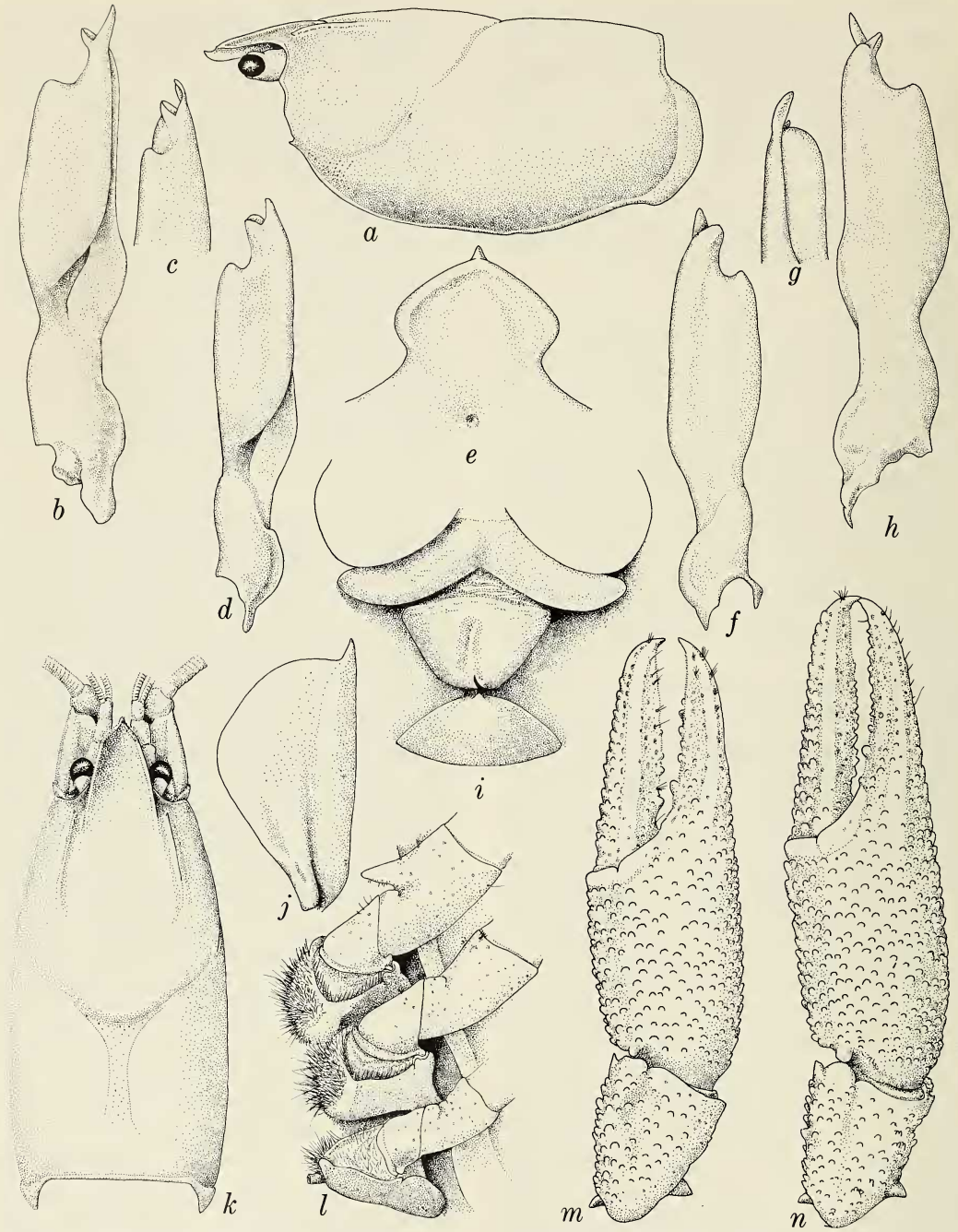


Fig. 1. *Procambarus (A.) mexicanus*—All except 1 (which from km 57 on Fortín-Huatusco-Conejos Road from El Mirador de Zacuapan, 8 km NE of Huatusco, Veracruz, Mexico (a–c, e, g, h, j–l, n from first form male; d, f, from second form male; i, m, from female): a, Lateral view of carapace; b, d, Mesial view of first pleopod; c, Cephalomesial view of distal part of first pleopod; e, Epistome; f, h, Lateral view of first pleopod; g, Caudal view of distal part of first pleopod; i, Annulus ventralis and adjacent sternal elements; j, Antennal scale; k, Dorsal view of carapace; l, Proximal podomeres of third, fourth, and fifth pereopods; m, n, Distal podomeres of cheliped.

central projection. Female with hinged annulus ventralis slightly longer than preannular plate, almost twice as wide as long, tapering posteriorly, and bearing short, sinuous sinus on midposterior surface; postannular sclerite as wide as, or slightly wider than, annulus but shorter; first pleopod reduced.

Topotypic male, form I: Cephalothorax (Fig. 1a, k) subcylindrical; maximum width of carapace slightly less than height at level of caudodorsal margin of cervical groove (11.8 and 12.0 mm). Abdomen only little narrower than thorax (11.2 and 11.8 mm). Areola 10.6 times as long as wide with 2 or 3 punctations across narrowest part. Cephalic section of carapace 1.5 times as long as areola, latter constituting 34.1 percent of entire length of carapace (40.9 percent of postorbital carapace length). Surface of carapace densely punctate dorsally, granulate laterally. Rostrum moderately broad with weakly convergent, slightly thickened margins, latter tapering rapidly from base of acumen which gently upturned apically and reaching slightly beyond distal end of penultimate podomere of antennular peduncle; upper surface distinctly concave, strongly so anteriorly. Subrostral ridge weak and evident in dorsal view only in posterodorsal part of orbit. Postorbital ridge moderately well developed and terminating cephalically in small acute spine not attaining level of orbit. Suborbital angle obtuse and not prominent. Branchiostegal spine clearly defined. Cervical spine represented by very small tubercle.

Abdomen longer than carapace (26.6 and 24.9 mm). Pleura of third through sixth segments subtruncate ventrally and rounded caudoventrally. Cephalic section of telson with 3 spines in right and 4 in left posterolateral corners, that adjacent to lateralmost on both sides movable. Cephalic lobe of epistome (Fig. 1e) subtriangular, lacking anteromedian excavation; main body with distinct fovea; epistomal zygoma arched. Ventral surface of proximal podomere of antennule with strong ventromesial spine

short distance distal to midlength. Antennal peduncle with short distolateral spine on basis; ischium with small tubercle; flagellum broken but probably reflexed only slightly posterior to first abdominal segment. Antennal scale (Fig. 1j) about twice as long as wide, greatest width distal to midlength; lamellar area approximately twice width of thickened lateral part. Third maxilliped slightly overreaching penultimate podomere of antennal peduncle; mesial sector of ventral surface of ischium with crowded clusters of both stiff and plumose setae, lateral sector studded with mat of plumose setae, ischium not produced distolaterally; merus with setae similarly dispersed.

Right chela (Fig. 1n) ovate in cross-section, weakly depressed; palm about 1.3 times as long as broad; its length little less than half length of chela; except for ridges and distal part of fingers, almost completely studded with squamous tubercles. Mesial surface of palm with tubercles somewhat staggered but roughly forming 3 rows of 9 to 11. Both fingers with low submedian longitudinal ridges dorsally and ventrally; ridges flanked proximally by tubercles and distally by punctations. Opposable margin of fixed finger with upper row of 11 tubercles, second from base largest, extending from base of finger almost to terminal corneous tip, and lower row of 6, proximalmost largest, along distal half of finger (between level of third and ninth tubercles of upper row); band of minute denticles extending along entire length of finger, separating upper and lower rows of tubercles; lateral surface of finger with row of tubercles along proximal half followed by row of punctations. Opposable margin of dactyl with dorsal row of 14 tubercles (third from base largest, some too small to be included in illustration) and lower row of 6 lying at level between second and thirteenth tubercles of upper row; mesial margin of finger with basal cluster of tubercles narrowing distally to single row where approaching corneous terminal part of finger.

Carpus of cheliped, except for proximal

Table 1.—Measurements (mm) of *Procambarus (A.) mexicanus*. (Left chela of syntype of *Cambarus aztecus*; right of others.)

	Neo-holotype ♂ I	Topotypes			♂* I
		♂ I	♀	♂ II	
Carapace:					
Entire length	22.7	24.9	26.9	26.2	21.5
Postorbital length	19.8	20.8	21.8	21.3	17.3
Width	10.8	11.8	12.4	11.9	11.1
Height	11.6	12.0	12.9	11.9	9.1
Areola:					
Width	0.7	0.8	0.9	0.8	0.7
Length	7.9	8.5	8.4	8.4	7.2
Rostrum:					
Width	4.0	4.2	4.6	4.3	3.6
Length	4.6	4.6	5.8	5.1	4.5
Chela:					
Length, palm mesial margin	7.9	8.5	6.6	7.1	7.0
Palm width	6.0	6.6	5.9	5.4	4.5
Length, lateral margin	19.0	20.0	17.1	18.6	14.8
Dactyl length	8.1	10.6	9.4	9.5	6.8
Abdomen:					
Width	—	11.2	12.9	10.9	9.7
Length	—	26.6	28.4	26.8	—

* Syntype of *Cambarus aztecus*.

dorsal and ventral areas and distolateral band, almost entirely tuberculate; only few tubercles mesially and 2 distoventral ones noticeably larger and less squamous than others. Merus also strongly tuberculate except for much of mesial and lateral surfaces; no spiniform ones dorsodistally; ventrolateral row consisting of 9 tubercles and ventromesial one of 15; both rows flanked by additional tubercles. Ventromesial surface of ischium with row of 3 prominent tubercles subtended by few scattered ones.

Hook on ischium of third pereiopod (Fig. 11) simple, acute, and overreaching basioischial articulation, not opposed by tubercle on basis. Coxa of fourth pereiopod without caudomesial boss, that of fifth with small

rounded boss compressed in longitudinal axis of body.

Sternum between third, fourth, and fifth pereiopods shallow, margined with plumose setae.

First pleopods (Fig. 1b, c, g, h) as described in "Diagnosis."

Uropods with both lobes of proximal podomere bearing acute spines; mesial ramus with distomedian spine terminating premarginally and with well developed distolateral spine; lateral ramus with fixed distolateral spine.

Topotypic female: Differing, other than in secondary sexual characteristics, from male, form I, in following respects: cervical spine obsolete; cephalic section of telson with 3 spines in each caudolateral corner; tubercle on ischium of antennal peduncle vestigial; mat of plumose setae on ventrolateral sector of ischium of third maxilliped less conspicuous; opposable margin of fixed finger of right chela (Fig. 1m) with upper row of 5 tubercles (proximalmost largest) in proximal three-fifths and lower row of 4 along penultimate fourth; opposable margin of dactyl with double row of 9 (10 on left) tubercles (proximalmost largest) in proximal three-fifths; minute denticles arranged in single row on dactyl but forming narrow band on propodus; ventral surface of merus with lateral row of 11 tubercles and mesial one of 15 (10 and 14, respectively on left member); carpus with row of 4 tubercles. (See Table 1 for measurements.)

Annulus ventralis and associated sternal sclerites (Fig. 1i) as illustrated.

Topotypic male, form II: Differing from first form male in following respects: rostrum not so concave, especially anteriorly; subrostral ridges evident in dorsal aspect to base of acumen; cephalic section of telson with 3 spines in each caudolateral corner; ischium of left antennal peduncle with well developed spiniform tubercle; opposable margin of fixed finger of cheliped with upper row of 12 tubercles (proximalmost largest)

and ventral row of 6 (10 and 5 on left chela); opposable margin of dactyl of cheliped with upper row of 9 tubercles (proximalmost largest) and lower row of 4 (5 on left); minute denticles forming much narrower band on both fingers than in male, form I; single spiniform tubercle present dorsodistally on merus of cheliped, ventral surface with lateral row of 9 and mesial row of 15 tubercles, rows joined distally by row of 4 tubercles; hook on ischium of third pereopod not reaching basioischial articulation. First pleopods (Fig. 1d, f) not contiguous basally, strongly resembling those of first form male except both terminal elements more robust, and shoulder on cephalic surface slightly more strongly produced; oblique juvenile suture also clearly defined.

Size.—The largest specimen examined is a second form male having a carapace length of 31.0 (postorbital carapace length, 26.0) mm. The smallest first form male has corresponding lengths of 18.8 and 14.5 mm. Neither ovigerous females nor ones carrying young have been observed.

Type locality.—El Mirador de Zacuapan, 8 km northeast of Huatusco, Veracruz. As pointed out above, Erichson did not cite a specific locality in Mexico when he described this crayfish. In his treatment of the *mexicanus* group, however, Villalobos (1954:312) chose a specimen from the locality cited here as the neoholotype, thereby designating El Mirador de Zacuapan as the type locality of Erichson's species.

Types.—Neoholotype (♂ I), Academy of Natural Sciences of Philadelphia (ANSP 421); neallotype (♀) and neomorphotype (♂ II), Instituto de Biología de la Universidad de Mexico (all designated by Villalobos 1954).

Range and specimens examined.—Specimens of this crayfish have been reported from a number of localities in Mexico south of the Cordillera Volcanica Transversal. All of those of which I am aware are listed here, and those from which material has been ex-

amined by me are followed by an enumeration of the specimens seen; at least some, and perhaps most, of the other localities need to be confirmed. Locations of the collections cited are recorded as follows: ANSP (Academy of Natural Sciences of Philadelphia), FMNH (Field Museum of Natural History, Chicago), IBM (Instituto de Biología, Universidad Nacional Autónoma de México), MCZ (Museum of Comparative Zoology, Harvard University), USNM (National Museum of Natural History, Smithsonian Institution).

VERACRUZ: (1) El Mirador (Faxon 1898:649) (=El Mirador de Zacuapan, 8 km NE of Huatusco—restricted type locality; see Villalobos 1954:312) 1 ♂ I (ANSP), neotype, 1894, Dr. Sartorius, coll.; 1 ♂ I, 2 ♂ II, 5 ♀ (USNM), Nelson & Goldman, coll. (2) Texola (near Xico), 1 ♂ I, 2 ♂ II (ANSP), 21 Mar 1899, S. N. Rhoades (Ortmann 1906: 11). (3) Jalapa (FMNH) (Faxon 1914:363). (4) Hacienda de Tenejapa (IBM?) (Rioja 1949:316). (5) Hacienda de Jalapilla, a 5 km al SE de Orizaba (IBM?) (Rioja 1949:322). (6) Rincón de La Doncella cercanías de Ciudad Mendoza (IBM?) (Villalobos 1953:365). (7) Tres Puentes, Col. Emiliano Zapala, Jalapa (IBM?) (Hobbs 1971:41). (8) Río Bejucos, 11.2 km S of Jalapa, 13 ♂ I, 30 ♂ II, 44 ♀, 24j ♂, 34j ♀ (USNM), 18 May 1930, E. P. Creaser & Gordon. (9) Río Bejucos, 4.8 km S of Jalapa, 18 May 1930, 1 ♂ II (USNM), E.P.C. et al. (10) Trib. to Río Bejucos at Coatepec, 1 ♂ I, 5 ♂ II, 10 ♀, 7j ♂, 7j ♀ (USNM), 25 Jul 1971, A. Villalobos F. (11) Arroyo Bejucos between Jalapa and Coatepec, among *Eichornia*, 1 ♂ I (USNM), 6 Sep 1971, N. Vidal. (12) Teocelo, at 300 m, 2 ♂ I, 1 ♀, 1j ♀ (USNM), 30 Dec 1940, W. W. Dalquest. (13) Km 35 carretera Cordoba-Huatusco, 3 ♂ I, 2 ♂ II, 5 ♀, 3j ♂, 3j ♀ (USNM), 26 Apr 1980, A.V.F.; 6 ♂ I, 15 ♂ II, 26 ♀ (USNM), 26 Apr 1980, A.V.F. (14) Huatusco, km 57 on Fortín-Huatusco-Conejos Road, 1 ♂ I, 1 ♀, 4j ♂, 2j ♀ (USNM), 8 Jul 1962, P. C. Holt. (15) Río Jamapa, 6 to

7 km NE of Coscomatepec (Holt 1973:17), 1 ♀, 9j ♂, 2j ♀ (USNM), 9 Jul 1962, P.C.H. (16) Spring at Tlilipan (Hobbs 1971:30), 1 ♂ I, 2 ♂ II, 2 ♀, 2j ♂ (USNM), 3 Aug 1967, J. R. Reddell. (17) Ojo de Agua, Tlilipan (Hobbs 1971:30), 3 ♂ II, 3 ♀ (USNM). 4 Aug 1967, J.R.R. (18) Pond 19.2 km E of Jalapa, 1 ♀, 4j ♂, 1j ♀ (USNM), 6 Mar 1941, N. E. Hartweg. (19) Santa María, 1 ♀ (USNM), 12 Feb 1894, USDA Biol. Expedition (Faxon 1898:649). (20) 3.5 km W of Huatusco on Hwy 143, 300 m alt, 1 ♂ II, 1 ♀ (USNM), 7 Jan 1978, J. R. Dixon. (21) 9.6 km SE of Coatepec on road to Teocelo, 1180 m alt, 1 ♀ (USNM) 8 Jan 1978, J.R.D. (22) Stream at water house about halfway up Los Cumbres, SW of Orizaba, 2 ♂ I, 3 ♀, 1j ♂ (USNM), 27 Dec 1940, H.H.H., Jr. (23) Nacimiento de Manzanilla, 11 km N Potrero, 5 ♂ II, 4 ♀, 1j ♂, 5j ♀ (USNM), 6 Jan 1977, J. R. R. & A. Grubbs.

In addition, specimens with areolae ranging from 12 to 17 times as long as broad, from two additional localities in the State of Veracruz (Fortín de Las Flores, 1 ♂ I, 7 ♀, 1j ♀ (USNM), 1 Nov 1969, A. Argano & V. Sbordoni; Copes Estate, Orizaba, 2j ♀ (USNM), date?, F. Sumichrast) are tentatively assigned to *P. (A.) mexicanus*. These specimens exhibit an array of variation sufficient to point out the difficulty in identifying members of the *mexicanus* Group of the subgenus *Austrocambarus*. (See Villalobos 1954:306.) Three of them possess rostra with produced, angular marginal prominences. One has strong cervical spines, another exhibits a strong spine on the left and a rather weak one on the right, four have weak ones, and, in three, there is hardly a trace of these spines; moreover, there is no correlation between the degree of their development and the size of the animal. The areola is narrower than that of most specimens here assigned to *P. (A.) mexicanus*, and the first form male is unique among all *Austrocambarus* that I have examined in that hooks are lacking from the ischia of the third pereopods. The first pleopods are situated quite far apart; the mesial process is

short, and the distal margin of the shoulder on the cephalic surface lies perpendicular to the axis of the pleopod, not produced cephalodistally.

Villalobos (1953:365–366) listed 18 localities from which he had specimens belonging to the “groupo *mexicanus*” (=Subgenus *Austrocambarus*). In his review of the group (1954, 1955, 1983), however, I have found references to only three of them: “5. Cerro Hueco . . . , Chis.,” “10. Presidio, Ver.,” and “11. El Castillo, . . . , Oax.” These were designated the type localities of *Procambarus mirandai*, *P. veracruzanus*, and *P. acanthophorus*, respectively, in his 1954 publication and cited as such in 1955 and 1983. Perhaps specimens from some of the other localities not subsequently mentioned by Villalobos are referable to *P. mexicanus*. If they are still extant they will likely be reported by Sr. Miguel A. Morales Mora who is currently studying the Mexican representatives of the subgenus *Austrocambarus*.

“*Cambarus aztecus* Saussure”

Fig. 2

Syntypic male, form I (dry): Cephalothorax (Fig. 2b, e) subovoate; maximum width of carapace greater than height at level of caudodorsal margin of cervical groove (11.1 and 9.1 mm). Abdomen narrower than thorax (9.7 and 11.1 mm). Cephalic section of carapace about twice as long as areola; latter 10.3 times longer than broad with 1 or 2 punctations across narrowest part. Surface of carapace densely punctate dorsally, becoming finely granulate ventrolaterally. Rostrum comparatively broad with margins not thickened and gently converging anteriorly to base of acumen where armed with minute corneous tubercles, otherwise not produced; upturned, corneous tip of acumen almost reaching distal end of ultimate podomere of antennular peduncle; dorsal surface of rostrum subplane basally, gradually becoming weakly excavate anteriorly, and bearing setiferous punctations

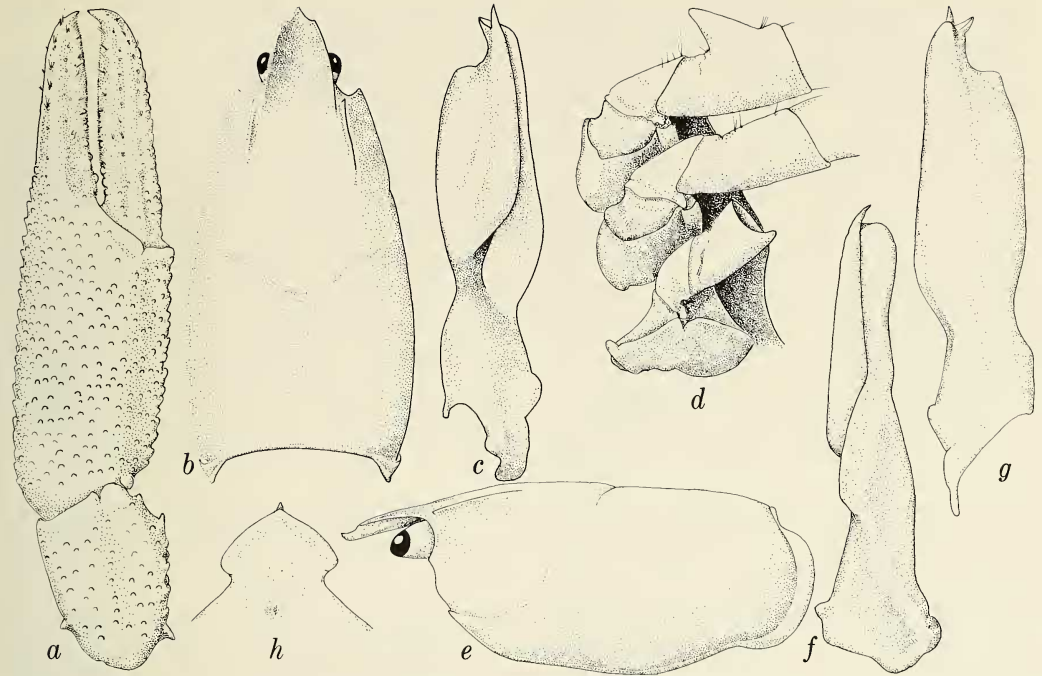


Fig. 2. *Cambarus aztecus*, syntypic male, form I: a, Dorsal view of distal podomeres of cheliped; b, Dorsal view of carapace; c, Mesial view of first pleopod; d, Proximal podomeres of third, fourth, and fifth pereiopods; e, Lateral view of carapace; f, Caudal view of first pleopod; g, Lateral view of first pleopod; h, Epistome.

which deeper and more abundant posteriorly than anteriorly. Subrostral ridge weak and evident dorsally only along about basal sixth of rostrum. Postorbital ridge well defined, moderately swollen caudally, and terminating anteriorly in small spine not reaching caudal margin of orbit. Suborbital angle weak and obtuse; branchiostegal spine small but clearly defined.

Abdomen longer than carapace but cannot be measured accurately because bent. Pleura of third through fifth segments very weakly arched and rounded caudoventrally. Cephalic section of telson with 3 spines in each caudolateral corner (middle one of each group movable). Cephalic lobe of epistome (Fig. 2h) subtriangular with anterolateral margins slightly thickened and very weakly arched; main body with clearly defined fovea; epistomal zygoma broadly arched. Ventral surface of proximal podomere of antennular peduncle with strong spine near midlength. Antennular peduncle with disto-

lateral spine on basis; ischium with small subacute tubercle; (flagellum lost). Antennal scale about twice as long as broad, widest slightly distal to midlength, greatest width of lamellar area about twice that of thickened lateral part. Third maxilliped slightly overreaching antennal peduncle; mesial sector of ventral surface of ischium bearing dense clusters of stiff, simple setae, and more delicate plumose ones; lateral sector with shorter and fewer stiff setae; ischium not produced distolaterally.

Left chela (Fig. 2a), right regenerated, subovate in cross section, weakly depressed; palm 1.7 times as long as broad, its length almost half maximum length of chela; palm and proximal part of fingers studded with crowded small tubercles (median longitudinal ridges polished, and distal two-thirds of fingers with setiferous punctations). Mesial surface of palm with tubercles arranged irregularly, but 2 or 3 ill-defined rows, consisting of 10 or 11 in each, discernible be-

tween proximal and distal margins. Dorsal and ventral surfaces of both fingers with low median longitudinal ridges flanked along distal two-thirds by setiferous punctations. Opposable margin of fixed finger with row of 5 tubercles (proximalmost largest) extending along slightly more than proximal half of finger; broad longitudinal band of minute denticles extending from base to corneous tip of finger, and single massive tubercle located below band at distal end of proximal third of finger; lateral surface with 2 tubercles basally followed by row of conspicuous setiferous punctations. Opposable margin of dactyl with row of 7 tubercles (second from base largest; most too small to be included in illustration) reaching level of row on fixed finger; broad band of minute denticles and single large tubercle situated below band just proximal to midlength of finger; corresponding margin of right chela with only 2 distinct tubercles: one above denticular band at end of proximal sixth of margin, and that below, slightly more distally.

Carpus of cheliped longer than broad with very shallow elongate depression; surface almost entirely tuberculate except proximoventrally, only those tubercles on mesial surface larger than tubercles elsewhere, and distal members there subspiniform; ventrodistal margin with prominent tubercle at articular knob and smaller one mesial to it. Merus with all surfaces tuberculate except proximal half to fourth of mesial and lateral surfaces; ventral surface with mesial row of 13 (14 on right) tubercles and lateral row of 8. Ischium with ventromesial row of 7 (5 on right) small tubercles.

Hook on ischium of third pereiopod (Fig. 2d) simple, acute, and reaching to, but not overreaching, basioischial articulation, and not opposed by tubercle on basis. Coxa of fourth pereiopod without caudomesial boss, but that of fifth with compressed (in longitudinal plane of body) boss at caudomesial angle.

Sternum between third, fourth, and fifth

pereiopods comparatively shallow, margined with plumose setae.

First pleopod (Fig. 2c, f, g) reaching coxa of third pereiopod; cephalic process wanting; mesial process and central projection unremarkable, shoulder on cephalic surface with cephalodistal extremity subtruncate, only slightly produced distally.

Uropods with both proximal lobes bearing acute spines; mesial ramus with distomedian spine situated premarginally and with well developed distolateral spine; lateral ramus with fixed distolateral spine flanked mesially by strong movable spine.

See Table 1 for measurements.

Procambarus (Austrocambarus)
olmecorum, new species

Fig. 3

Procambarus aztecus.—Rioja, 1949:321.—Villalobos, 1954:306, 312, 314 (in part)—321, 323, 328, pls. 3, 4; 1955:160, 161, 169 (in part)—176, 178, 183, pls. 36, 37; 1983:154, 155, 164–170, 171, 176, 227, pls. 36, 37.—Hobbs and Villalobos, 1964:313.—Hobbs, 1966:71; 1971:3, 12, 22, 27, 30, 31, 41.—Holt, 1973:4, 24, 25.—Hart and Hart, 1974:22, 23, 86.

Procambarus mexicanus.—Rioja, 1949:321 [part: Costomatepec, Ver.]

Procambarus (Austrocambarus) aztecus.—Villalobos, 1982:219.

All of the above synonyms are traceable to the misidentification of crayfish from Tomatlán, first cited as hosts of the entocytherid ostracod *Ankylocythere bidentata* by Rioja (1949:321) and later fully described and illustrated by Villalobos (1954). Hobbs (1966), in summarizing our current knowledge of the entocytherids of Mexico, accepted the previously reported identification of the host as did Hart and Hart (1974). In Holt's (1973) account of the Mexican branchiobdellid worms, he employed the identifications furnished by Villalobos.

After having compared Villalobos' description and illustrations with syntypes of

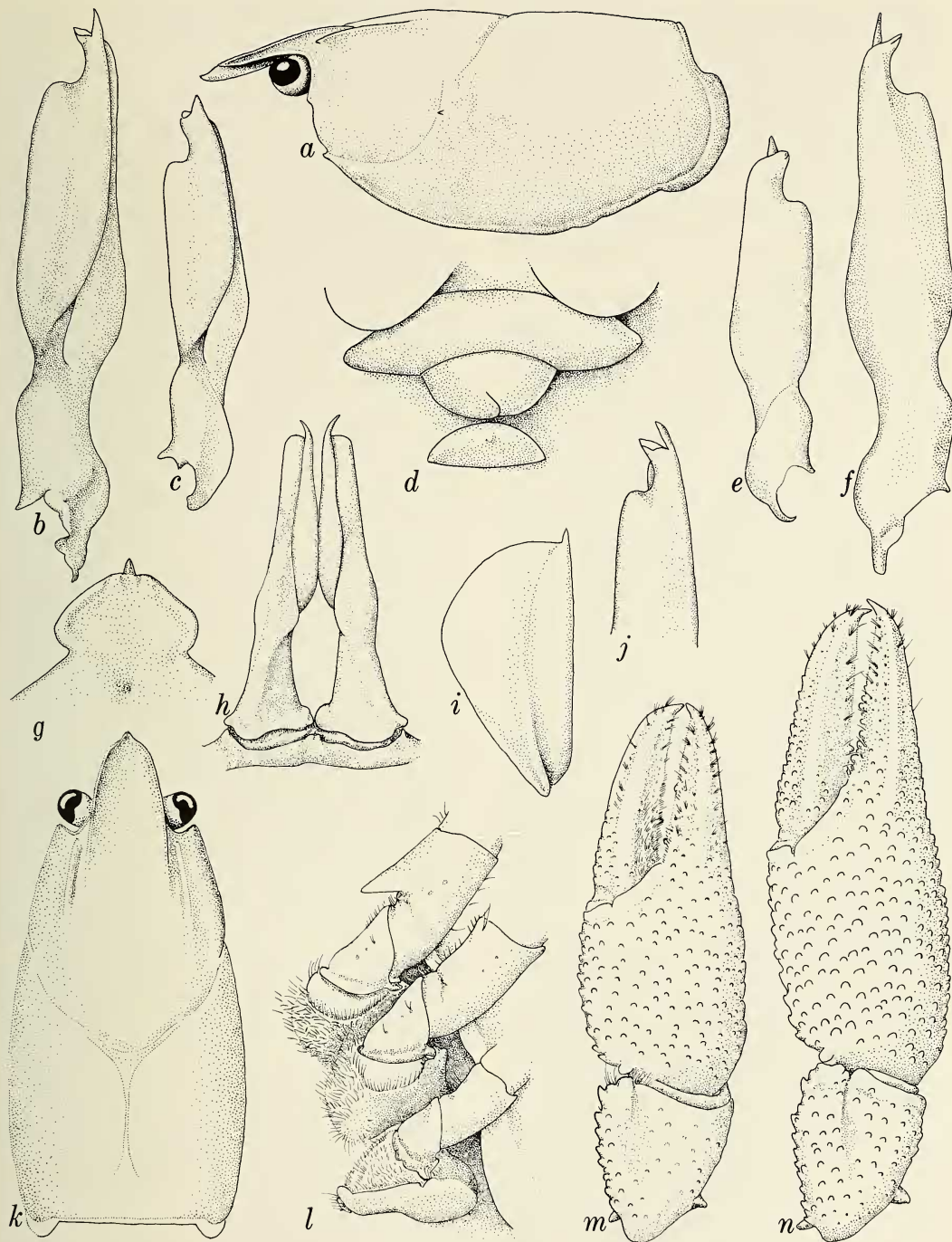


Fig. 3. *Procambarus (A.) olmecorum* (a, b, f-l, n from holotype; c, e from morphotype; d, m from allotype): a, Lateral view of carapace; b, c, Mesial view of first pleopod; d, Annulus ventralis and adjacent sternal elements; e, f, Lateral view of first pleopod; g, Epistome; h, Caudal view of first pleopods; i, Antennal scale; j, Cephalomesial view of first pleopod; k, Dorsal view of carapace; l, Proximal podomeres of third, fourth, and fifth pereiopods; m, n, Dorsal view of distal podomeres of cheliped.

Cambarus aztecus Saussure, Hobbs (1972b: 44) pointed out that "specimens described as *Procambarus aztecus* by Villalobos (1954: 44) are not members of this [Saussure's] species and must receive a new name." The name *olmecorum*, honoring the artistic Olmec nation which in earlier times contributed so much to Mexican culture, is offered as a substitute name for Villalobos' *Procambarus aztecus*.

Diagnosis.—Body pigmented, eyes well developed. Rostrum of adults without marginal spine and median carina. Carapace with small cervical spine. Areola linear or obliterated along part of its length and constituting 30.5 to 35.7 (average 33.8) percent of total length of carapace (38.9 to 45.5, average 41.2 percent of postorbital carapace length). Suborbital angle weak and obtuse; infraorbital spines lacking. Postorbital ridge moderately strong and anterior extremity with or without spine or tubercle. Branchiostegal spine small. Antennal scale about twice as long as broad, widest slightly distal to midlength. Cheliped studded with squamous tubercles from midlength of merus to midlength of fingers. Ischium of third pereopod of first form male with simple, strong, acute hook overreaching basioischial articulation; hook not opposed by tubercle on corresponding basis. First pleopods of first form male reaching coxae of third pereopods, symmetrical, contiguous basally, lacking proximomesial spur; subangular shoulder present on cephalic surface at about base of distal eighth; lacking subterminal setae; terminal elements consisting of short, acute, distolaterally directed mesial process extending beyond short, corneous, acute, cephalodistally directed central projection. Female with hinged annulus ventralis only slightly longer than well developed preannular plate, about twice as wide as long, broadly arched posteriorly, and bearing short sinuous sinus on midposterior surface; postannular sclerite as wide as annulus and only slightly shorter; first pleopod greatly reduced.

Holotypic male, form I: Cephalothorax

(Fig. 3a, k) subovate, weakly compressed laterally; maximum width of carapace slightly greater than height at level of caudodorsal margin of cervical groove (12.9 and 12.0 mm). Abdomen narrower than thorax (11.0 and 12.9 mm). Areola linear. Cephalic section of carapace about 1.9 times as long as areola, latter constituting 34 percent of total length of carapace (42.2 percent of postorbital carapace length). Surface of carapace densely punctate dorsally and finely tuberculate laterally, only on anterior half of rostrum sparsely punctate. Rostrum comparatively broad with weakly convergent margins, tapering rather strongly anteriorly but base of acumen not clearly defined, apex slightly upturned and reaching midlength of ultimate podomere of antennular peduncle; margins not thickened; upper surface very weakly concave, almost flat. Subrostral ridge weak and not evident in dorsal aspect except along caudal margin of orbit. Postorbital ridge moderately strong, only faintly swollen caudally, and terminating anteriorly in small spine not attaining level of orbit. Suborbital angle weak and obtuse; branchiostegal spine very small but acute. Cervical spine small but distinct.

Abdomen longer than carapace (25.8 and 21.8 mm). Pleura of third through fifth segments weakly arched and rounded caudoventrally. Cephalic section of telson with 3 spines (middle one of group movable) in each caudolateral corner. Cephalic lobe of epistome (Fig. 3g) subtriangular with slightly excavate anterior angle, margins not thickened, main body with distinct fovea; epistomal zygoma arched. Ventral surface of proximal podomere of antennular peduncle with spine near midlength. Antennal peduncle with short distolateral spine on basis; ischium without spine or tubercle; flagellum broken but reaching second abdominal segment. Antennal scale (Fig. 3i) about twice as long as broad, widest slightly distal to midlength, greatest width of lamellar area about twice that of thickened lateral part. Third maxilliped overreaching antennal peduncle by length of ultimate podomere; me-

sial sector of ventral surface of ischium with crowded clusters of both simple stiff and more flexible plumose setae, lateral sector studded with mat of plumose setae, ischium not produced distolaterally.

Right chela (Fig. 3n) subovate in cross-section, weakly depressed; palm almost 1.2 times as long as broad; its mesial length almost half maximum length of chela; except for ridges and apices of fingers, almost entire surface studded with closely set squamous tubercles. Mesial surface of palm with 3 irregular rows of about 8 tubercles, others interspersed between rows. Both fingers with low median longitudinal ridges dorsally and ventrally; ridges flanked by tubercles except distally where replaced by setiferous punctations. Opposable margin of fixed finger with row of 13 (left with 14) tubercles (more distal ones too small to be included in illustration), second from base largest, extending along proximal four-fifths of finger, and row of 3 (2 on left) tubercles, proximalmost largest, on lower level along middle fifth of finger; minute denticles present between rows of tubercles and reaching corneous tip of finger. Opposable margin of dactyl bearing row of 12 (left with 13) tubercles, third from base largest and proximal 2 (0 on left) fused; narrow band of minute denticles interspersed between tubercles and extending to base of corneous tip of finger, opposing those on fixed finger.

Carpus of cheliped longer than broad with shallow furrow dorsally; furrow flanked by squamous tubercles; entire podomere studded with similar tubercles, one or 2 on mesial surface and another on ventrodistal margin slightly more elevated than others but none conspicuously larger than others. Merus with all surfaces tuberculate except proximal fourth of mesial and lateral surfaces; dorsal surface with tubercles increasing in size distally; ventral surface with mesial row of 12 tubercles and irregular lateral row of 14 (left with 13). Ischium with row of 3 (left with 5) tubercles ventromesially.

Hook on ischium of third pereopod (Fig. 3l) simple, acute, and overreaching basiois-

chial articulation, not opposed by tubercle on basis. Coxa of fourth pereopod without caudomesial boss, but that of fifth with small tuberculiform one at caudomesial angle.

Sternum between third, fourth, and fifth pereopods shallow, margined with plumose setae.

First pleopods (Fig. 3b, f, h, j) as described in "Diagnosis."

Uropods with both lobes of proximal podomere bearing acute spines; mesial ramus with distomedian spine situated distinctly premarginally and with well developed distolateral spine; lateral ramus with fixed distolateral spine flanked mesially by very strong movable spine.

Allotypic female: Differing from holotype, other than in secondary sexual features, in following respects: maximum width of carapace distinctly greater than height; base of acumen clearly defined by suddenly contracted rostral margins; tip of rostrum more strongly upturned and reaching base of distal third of ultimate podomere of antennular peduncle; postorbital spine reaching level of posterior margin of orbit; abdomen only slightly shorter than carapace; pleuron of fifth abdominal segment with ventral margin straight, not arched; anterior margin of epistome rather evenly and strongly arched, and zygoma broadly so; ischium of antennal peduncle with very small, acute, tuberculiform spine ventrally; third maxilliped almost reaching distal end of antennal peduncle.

In addition, chela (Fig. 3m) much smaller than that of holotype with width of palm slightly greater than length of mesial margin, latter much less than half length of chela; opposable margin of fixed finger with row of 6 tubercles (most too small to be evident in illustration), basal one largest, 3 in proximal group separated from those in distal group by considerable gap in which 1 tubercle situated on lower level at about mid-length of finger; opposable margin of dactyl with row of 9 tubercles (small and hidden by setae), proximal 3 subequal in size and larger than more distal ones; carpus with 2

Table 2.—Measurements (mm) of *Procambarus (A.) olmecorum*.

	Holotype	Allotype	Morpho- type
Carapace:			
Entire length	27.0	25.5	20.4
Postorbital length	21.8	20.3	16.3
Width	12.9	12.1	10.8
Height	12.0	12.1	10.0
Areola:			
Width	linear	linear	linear
Length	9.2	8.8	7.0
Rostrum:			
Width	4.4	4.0	3.5
Length	6.0	5.6	4.2
Right chela:			
Length, palm mesial margin	7.8	4.7	4.1
Palm width	6.7	5.0	4.2
Length, lateral margin	17.9	12.0	10.5
Dactyl length	9.8	7.0	5.5
Abdomen:			
Width	11.0	10.8	8.5
Length	25.8	25.0	20.6

distal tubercles on mesial surface and 1 on distal ventrolateral articular condyle distinctly spiniform and slightly larger than neighboring tubercles; ventral surface of merus with row of 11 tubercles mesially and 5 or 7 (left) laterally.

Sternum between third, fourth, and fifth pereopods shallow. Annulus ventralis and associated sternites as figured (Fig. 3d) and described in "Diagnosis."

Morphotypic male, form II: Differing from holotype in following respects: base of acumen more sharply defined than in holotype although acumen broken, probably reaching anteriorly at least as far as mid-length of ultimate podomere of antennular peduncle; postorbital ridge lacking spine at anterior extremity and not attaining level of orbit; suborbital angle more distinctly angular than in holotype; branchiostegal spine obsolete; cephalic lobe of epistome and zygoma as in allotype; third maxilliped just

reaching ultimate podomere of antennular peduncle; tubercles and spines on chelipeds only slightly different from those of holotype; hook of ischium of third pereopod much reduced, and coxa of fifth pereopod bearing only slightly reduced boss.

First pleopods (Fig. 3c, e) differing only slightly from that of first form male, differing chiefly in the absence of cornified tip on central projection and both terminal elements less acute.

Type locality.—Arroyo to Río Metlac near "edge" of Fortín de Las Flores, Veracruz, Mexico.

Disposition of types.—The holotypic male, form I, allotype, and morphotype are deposited in the National Museum of Natural History (Smithsonian Institution) nos. 217626, 217627, and 217628, respectively, as are the paratypes consisting of 1 ♂ I, 1 ♂ II, 5 ♀, and 1j ♀. These specimens constitute the type series.

Size.—The largest specimen available is a female from Cuitahuac having a carapace length of 36.4 mm (postorbital carapace length 30.0 mm); the holotype (see Table 2) is the smallest of the three first form males. Females carrying eggs or young are unknown.

Range and specimens examined.—*Procambarus (A.) olmecorum* is known to occur in only six localities, all in the state of Veracruz, Mexico: (1) type locality, 3 ♂ I, 2 ♂ II, 6 ♀, 1j ♀ (USNM), 13 Mar 1974, R. R. Miller et al. (2) Cuitahuac, 2 ♀ (USNM), 10 Aug 1964, P. J. Spangler. (3) Nacimiento de Manzanilla, 17.6 km N of Potrero, 1 ♂ I (USNM), 6 Jan 1977, J. R. Reddell & A. G. Grubbs. (4) Tomatlán, 14 km SSW of Huatusco (IBM?) (Villalobos, 1954:321; 1955:176; 1983:168). (5) 3 km S of Coscomatepec (IBM?) (Villalobos 1954:321; 1955:176; 1983:168). (6) Sinkhole on south side of highway between Jalapa and Veracruz (Hobbs 1971:30), 3 ♂ I, 1 ♂ II, 3 ♀, 1j ♂, 3j ♀ (USNM), 19 Dec 1966, R. R. M. & W. L. Minckley. These lie at altitudes between 800 and 1600 m in the drainage basins of Río Atoyac and Río Jamapa, which

unite before entering the Gulf of Mexico a few km south of the city of Veracruz.

Variations.—The rostrum reaches anteriorly from the base to the end of the ultimate podomere of the antennular peduncle, and the margins vary from being distinctly subangular at the base of the acumen to tapering with little interruption from their bases; the postorbital ridges terminate anteriorly either in a short spine or tubercle; the areola is either obliterated along part of its length or is linear; and the cervical spine although never conspicuous may be rather well developed or reduced to a tubercle scarcely larger than others nearby. The telson is also variable, sometimes subrectangular, but often with the posterior section somewhat tapering. As in all members of *Austrocambarus*, the chelipeds are studded with crowded tubercles, but the numbers and disposition exhibit conspicuous individual differences.

The most distinctive of the populations assigned to this species is that from the sixth locality cited above. In the specimens from there, the rostral margins converge little anteriorly to the base of the acumen where they turn sharply mesially forming distinct angles before tapering to the apex of the acumen which just reaches, or only slightly overreaches, the base of the distal podomere of the antennular peduncle. The chelipeds in one of the males are conspicuously slender. Too, the shoulder on the cephalic surface of the first pleopod of two of the first form males is more strongly produced distally and more acute than that of the holotype, but in the other it is only little more prominent.

Relationships.—*Procambarus* (*A.*) *olmecorum* has its closest affinities with *Procambarus* (*A.*) *mexicanus*, *P. (A.) veracruzanus*, and *P. (A.) ruthveni zapoapensis*. As in *mexicanus*, the rostrum lacks marginal spines, but the areola is distinctly much narrower, similar to that of *veracruzanus* and *ruthveni zapoapensis*, but in them the rostral margins bear spines or spiniform tubercles at the base of the acumen. The de-

velopment of the shoulder on the cephalic margin of the pleopod of the first form male is variable, ranging from being almost truncate to being produced cephalodistally in acute prominences but never sloping proximally as in *ruthveni zapoapensis*. Among the members of the subgenus *Austrocambarus*, the unique combination of characters exhibited by *P. (A.) olmecorum* is: rostrum without produced anterolateral margins; areola linear or obliterated along part of its length; and first pleopod of first form male with subangular shoulder subtruncate or produced distally but never sloping proximally.

Acknowledgments

I wish to acknowledge the cooperation and help given me by the late Dr. Alejandro Villalobos-Figueroa and to extend my appreciation to those (see the paragraphs devoted to "Range and Specimens examined") who donated specimens to the Smithsonian. I am also grateful to T. E. Bowman, a Smithsonian colleague, to Joseph F. Fitzpatrick, Jr., of the University of South Alabama, and to H. H. Hobbs III of Wittenberg University, for their criticisms of the manuscript.

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